Listing of Claims:

Claims 1-86 (Canceled).

87. (Currently Amended) ~~The~~ An optical element producing method ~~described in claim 86,~~ of producing an optical element with a microscopic predetermined pattern thereon, said method comprising:

irradiating an electron beam onto a layer of a base material; and

~~wherein the predetermined pattern is formed by~~ controlling an energy amount of the electron beam ~~exposed on~~ irradiated onto the layer of the base material to draw the predetermined pattern;

wherein the pattern-drawn layer comprises a curved surface on which the predetermined pattern is drawn.

88. (Currently Amended) The optical element producing method described in claim 87, wherein a depth ~~formed~~ at a point on the predetermined pattern is ~~varied~~ set by controlling the energy amount of the electron beam ~~exposed~~ irradiated to the layer at the point.

89. (Currently Amended) The optical element producing method described in claim 88, wherein the energy amount of the

electron beam ~~at the point~~ is controlled within a depth of focus ~~at a focus position~~ of the electron beam.

90. (Currently Amended) ~~The~~ An optical element producing method ~~described in claim 86,~~ of producing an optical element with a microscopic predetermined pattern thereon, said method comprising:

irradiating an electron beam onto a layer of a base material to draw the predetermined pattern; and

~~wherein the focus~~ changing a position of a depth of focus of the electron beam ~~on the base material is adjusted~~ by controlling an electron lens, so as to ~~shift a heightwise~~ adjust a drawing position of the ~~focus position within a depth of focus~~ electron beam on the base material;

wherein the pattern-drawn layer comprises a curved surface on which the predetermined pattern is drawn.

Claim 91 (Canceled).

92. (Currently Amended) ~~The~~ An optical element producing method ~~described in claim 86, further~~ of producing an optical element with a microscopic predetermined pattern thereon, said method comprising ~~the steps of~~:

irradiating an electron beam onto a layer of a base material to draw the predetermined pattern;

forming a molding die based on ~~the basis of~~ the base material ~~on which~~ with the predetermined pattern ~~has been~~ drawn thereon; [[,]] and

producing an optical element by conducting an injection molding ~~for~~ process with the molding die;

wherein the pattern-drawn layer comprises a curved surface on which the predetermined pattern is drawn.

93. (Currently Amended) ~~The~~ An optical element producing method ~~described in claim 86, further~~ of producing an optical element with a microscopic predetermined pattern thereon, said method comprising ~~the steps of~~:

irradiating an electron beam onto a layer of a base material to draw the predetermined pattern;

developing the base material irradiated with the electron beam; [[,]] and

conducting an electroforming process on the developed base material ~~so as~~ to form a molding die;

wherein the pattern-drawn layer comprises a curved surface on which the predetermined pattern is drawn.

94. (Currently Amended) The optical element producing method described in claim 93, ~~wherein the base material is subjected to~~ further comprising conducting an etching process on the base material before the electroforming process.

95. (Currently Amended) ~~The~~ An optical element producing method ~~described in claim 86, wherein the drawing step is conducted for a first base material and a second base material respectively, and the optical element producing~~ of producing an optical element with a microscopic predetermined pattern thereon, said method ~~further~~ comprising ~~the steps of~~:

irradiating an electron beam onto a layer of a first base material to draw a first pattern thereon;

irradiating an electron beam onto a layer of a second base material to draw a second pattern thereon;

forming a first molding die and a second molding die respectively based on the first and second base materials;

assembling a mold by arranging the first and second molding dies to be opposite to each other; and

conducting an injection molding ~~for~~ process with the mold so as to form ~~an~~ the optical element ~~having a configuration corresponding~~ such that the predetermined pattern corresponds to the first and second patterns drawn on the ~~the~~ first and second base materials.

96. (Currently Amended) The optical element producing method described in claim 95, wherein one of the first pattern and the second pattern comprises a polarized light splitting structure ~~is drawn on one of the first and second base materials~~ and the other of the first pattern and the second pattern comprises a diffractive grating structure ~~is drawn on the other base material~~.

97. (Currently Amended) The optical element producing method described in claim 95, wherein one of the first pattern and the second pattern comprises a birefringence phase structure ~~is drawn on one of the first and second base materials~~ and the other of the first pattern and the second pattern comprises a diffractive grating structure ~~is drawn on the other base material~~.

Claim 98 (Canceled).

99. (Currently Amended) ~~The~~ A pattern drawing method ~~described in claim 98,~~ of forming a predetermined pattern on a layer of a base material, said method comprising:

irradiating an electron beam onto the pattern-drawn layer; and

~~wherein the predetermined pattern is formed by~~ controlling an energy amount of the electron beam ~~exposed on~~ irradiated onto the layer of the base material to draw the predetermined pattern;

wherein the layer comprises a curved surface on which the predetermined pattern is drawn.

100. (Currently Amended) The pattern drawing method described in claim 99, wherein the energy amount of the electron beam is controlled in accordance with a predetermined dose amount.

101. (Currently Amended) The pattern drawing method described in claim 99, wherein a depth ~~formed~~ at a point on the predetermined pattern is ~~varied~~ set by controlling the energy amount of the electron beam ~~exposed~~ irradiated to the layer at the point.

102. (Currently Amended) The pattern drawing method described in claim 101, wherein the energy amount of the electron beam ~~exposed at the point~~ is controlled within a depth of focus ~~at a focus position~~ of the electron beam.

103. (Currently Amended) ~~The~~ A pattern drawing method ~~described in claim 98,~~ of forming a predetermined pattern on a layer of a base material, said method comprising:

irradiating an electron beam onto the pattern-drawn layer; and

~~wherein the step of drawing is conducted by~~ changing a ~~focus~~ drawing position of the electron beam ~~relatively~~ on to the base material to draw the predetermined pattern;

wherein the layer comprises a curved surface on which the predetermined pattern is drawn.

104. (Currently Amended) The pattern drawing method described in claim 103, wherein the ~~focus~~ drawing position of the electron beam on the base material is changed by adjusting ~~the~~ a depth of focus ~~position~~ of the electron beam.

105. (Currently Amended) The pattern drawing method described in claim 104, wherein the depth of focus ~~position~~ of the electron beam ~~on the base material~~ is adjusted by controlling an electron lens of the electron beam so as to ~~shift a heightwise position of~~ adjust the ~~focus~~ drawing position ~~within a depth of focus~~.

106. (Currently Amended) The pattern drawing method described in claim 105, wherein the ~~focus position of the~~ electron ~~beam~~ lens is ~~adjusted~~ controlled by controlling a value of an electric current for the electron lens.

107. (Currently Amended) The pattern drawing method described in claim 103, wherein the ~~focus~~ drawing position of the electron beam is changed by ~~conducting a positional adjustment while~~ moving the base material.

108. (Currently Amended) The pattern drawing method described in claim 103, wherein the ~~focus~~ drawing position of the electron beam is changed by at least one of adjusting ~~the~~ a depth of focus ~~position~~ of the electron beam ~~or by conducting a positional adjustment while~~ and moving the base material.

109. (Currently Amended) The pattern drawing method described in claim 108, further comprising ~~a calculating step of~~ calculating at least a ~~heightwise position~~ height of ~~a pattern-drawn~~ a pattern-drawing position on the base material at which the pattern is to be drawn.

Claim 110 (Canceled).

111. (Currently Amended) The pattern drawing method described in claim ~~110~~ 109, wherein the predetermined pattern ~~drawing step comprises a step of~~ is drawn by drawing a pattern ~~for at least~~ on a first field of a unit space in a three-dimensional reference coordinate system based on ~~the basis of~~ the calculated ~~pattern-drawn~~ pattern-drawing position, and ~~a step of~~ then drawing a pattern for at least a second ~~filed~~ field while ~~conducting again the~~ calculating a pattern drawing position in the at least the second field at which the pattern is to be drawn. ~~step and the position adjusting step after completing the pattern drawing step for the first field.~~

112. (Currently Amended) The pattern drawing method described in claim 109, further comprising ~~a thickness distribution measuring step of~~ measuring ~~the~~ a thickness distribution of the base material ~~beforehand~~ before calculating the height of the pattern-drawing position.

113. (Currently Amended) The pattern drawing method described in claim 112, wherein the ~~calculation step calculates at least the heightwise position~~ height of the ~~pattern-drawn~~ pattern-drawing position is calculated based on ~~the basis of~~ the thickness distribution of the base material.

114. (Currently Amended) The pattern drawing method described in claim 112, ~~further comprising a thickness distribution measuring step of measuring~~ wherein the thickness distribution of the base material is measured while irradiating the electron beam.

115. (Currently Amended) The pattern drawing method described in claim 112, further comprising ~~the steps of~~:

~~a reference point measuring step of~~ measuring positions of a plurality of reference points while irradiating the electron beam; [[,]] and

~~a correcting step of~~ correcting the measurement of the thickness distribution based on ~~the basis of~~ the positions of the plurality of reference points, while irradiating the electron beam.

116. (Currently Amended) The pattern drawing method described in claim 115, wherein measuring the thickness distribution ~~measuring step includes a step of~~ comprises:

calculating a first three-dimensional reference coordinate system in the base material based on ~~the basis of~~ the plurality of reference points; ~~measured beforehand on the base material~~ and

~~a step of~~

calculating at least a first ~~heightwise~~ height position ~~of the pattern-drawn position~~ in the first reference coordinate system; [[,]] and ~~the~~

wherein correcting ~~step includes a step of~~ the measurement of the thickness distribution comprises:

calculating a second three-dimensional reference coordinate system in the base material based on ~~the basis of~~ a plurality of reference points measured when the base material is placed on a pattern drawing stage; and ~~a step of~~

calculating a second ~~heightwise~~ height position in the second reference coordinate system corresponding to the first ~~heightwise~~ height position as a ~~heightwise position~~ height of the ~~electron beam at the pattern-drawn~~ pattern-drawing position.

117. (Currently Amended) The pattern drawing method described in claim 115, wherein ~~the reference point~~ measuring ~~step includes a step of~~ the positions of the plurality of reference points comprises:

irradiating a light beam to the base material from a direction ~~approximately~~ substantially perpendicular to the electron beam; ~~, a step of~~

detecting a light intensity distribution based on the light beam passing through the base material ~~on the basis of the light beam~~; and ~~a step of~~

calculating ~~the heightwise position~~ a height of the base material based on ~~the basis of~~ the light intensity distribution.

118. (Currently Amended) The pattern drawing method described in claim 115, wherein ~~the reference point~~ measuring ~~step includes steps of~~ the positions of the plurality of reference points comprises:

irradiating a first light beam to the base material from a direction crossing the electron beam to be reflected off a bottom portion of the base material; ~~and~~

detecting a first light intensity distribution ~~reflecting~~ based on the first light beam reflected from ~~a flat~~ the bottom portion of the base material ~~on the basis of the first light beam; steps of~~

irradiating a second light beam different from the first light beam to the base material from a direction substantially perpendicular to the electron beam; ~~and~~

detecting a second light intensity distribution based on the second light beam passing through the base material; ~~on the basis of the second light beam and steps of~~

calculating a ~~heightwise position~~ height of ~~the~~ a flat portion based on ~~the basis of~~ the first intensity distribution; and

calculating a ~~heightwise position~~ height of a point on ~~a~~ the curved surface ~~portion projecting from the flat portion~~ of the base material based on ~~the basis of~~ the second intensity distribution.

119. (Currently Amended) The pattern drawing method described in claim 109, wherein ~~the~~ calculating ~~step includes a step of~~ the height of the pattern-drawing position comprises:

calculating a first three-dimensional reference coordinate system in the base material based on ~~the basis~~ of a plurality of reference points measured beforehand on the base material; ~~, a step of~~

calculating at least a first ~~heightwise~~ height position ~~of the pattern-drawn position~~ in the first reference coordinate system; ~~, a step of~~

calculating a second three-dimensional reference coordinate system in the base material based on ~~the basis of~~ a plurality of reference points measured when the base material is placed on a pattern drawing stage; [[,]] and ~~a step of~~

calculating a second ~~heightwise~~ height position in the second reference coordinate system corresponding to the first ~~heightwise~~ height position as a ~~heightwise position at the pattern-drawn~~ height of the pattern-drawing position ~~of the electron beam~~.

120. (Currently Amended) The pattern drawing method described in claim 109, wherein ~~the~~ calculating ~~step~~ the height of the pattern-drawing position is carried out while irradiating the electron beam.

Claims 121-124 (Canceled).

125. (Currently Amended) ~~The~~ A pattern drawing method ~~described in claim 124,~~ of forming a predetermined pattern on a layer of a base material, said method comprising:

irradiating an electron beam onto the pattern-drawn layer to draw the predetermined pattern;

wherein the layer comprises a curved surface on which the predetermined pattern is drawn;

wherein the predetermined pattern corresponds to a specific pattern for an optical element; and

wherein the specific pattern comprises a diffractive grating structure which is formed based on ~~the basis of~~ a predetermined dose distribution for the electron beam corresponding to a scanning position of the electron beam.

126. (Currently Amended) The pattern drawing method described in claim 125, wherein ~~the characteristic~~ a contour of the dose distribution is defined beforehand.

127. (Currently Amended) The pattern drawing method described in claim 125, wherein ~~the characteristic of~~ the dose distribution is ~~one that is extracted in accordance with~~ based on an inclination angle of a slope ~~on~~ of the curved surface portion.

128. (Currently Amended) ~~The~~ A pattern drawing method ~~described in claim 123,~~ of forming a predetermined pattern on a layer of a base material, said method comprising:

irradiating an electron beam onto the pattern-drawn layer to draw the predetermined pattern;

wherein the layer comprises a curved surface on which the predetermined pattern is drawn;

wherein the predetermined pattern corresponds to a specific pattern for an optical element; and

wherein the specific pattern ~~includes~~ comprises a ~~pattern for reducing~~ surface reflection reducing structure.

129. (Currently Amended) The pattern drawing method described in claim 128, wherein ~~when~~ the reflection reducing structure comprises concave and convex portions ~~are formed for~~

~~the pattern for reducing surface reflection~~, and a dose distribution for the electron beam including a dose for ~~a~~ the concave ~~or~~ and convex ~~portion~~ portions is calculated for a scanning position of the electron beam based on ~~the basis of the characteristic~~ a contour of the dose distribution and ~~a~~ the predetermined pattern ~~drawing on the base material is carried out~~ is drawn based on the dose distribution.

130. (Currently Amended) The pattern drawing method described in claim 129, wherein the ~~characteristic~~ contour of the dose distribution is defined beforehand.

131. (Currently Amended) The pattern drawing method described in claim 128, wherein the specific pattern ~~includes~~ further comprises a diffractive grating structure ~~and the pattern for reducing surface reflection~~.

132. (Currently Amended) The pattern drawing method described in claim 131, wherein at least one pitch portion of ~~a~~ the diffractive grating structure is formed with a tilt on the curved surface portion of the base material, and the reflection reducing structure comprises concave and convex portions ~~for reducing surface reflection are~~ formed ~~for~~ in the at least one pitch portion.

133. (Currently Amended) The pattern drawing method described in claim 132, wherein ~~the characteristic~~ a contour of ~~the~~ a dose distribution for the electron beam is ~~extracted in accordance with~~ based on an inclination angle of a slope on the curved surface.

134. (Currently Amended) The pattern drawing method described in claim 132, wherein the at least one pitch portion ~~of a diffractive grating~~ comprises a side wall portion ~~rising up on the base material~~ at an end ~~position~~ of the pitch portion and a slope portion ~~formed between~~ extending from the side wall portion to a neighboring side wall ~~portions~~ portion, and wherein the concave and convex portions are formed on the slope portion.

135. (Currently Amended) The pattern drawing method described in claim 132, wherein the concave and convex portions comprise ~~a large number of~~ tapered hole portions.

136. (Currently Amended) The pattern drawing method described in claim 135, wherein ~~pattern drawing is done so as to make~~ a ratio of ~~the~~ a combined area of the hole portions to ~~the~~ an area of the slope portion ~~to be~~ is a predetermined ratio.

137. (Currently Amended) The pattern drawing method described in claim 131, wherein each of at least two pitch portions of the diffractive grating ~~comprise~~ comprises a side wall portion ~~rising up on the base material~~ at an end ~~position of the pitch~~ thereof and a slope portion ~~formed between~~ extending from the side wall portion to a neighboring side wall ~~portions~~ portion, and ~~a~~ wherein the reflection reducing structure is formed on the slope portion of said each of the at least two pitch portions so as to reduce reflection of a light beam entering the slope portion or emerging from the slope portion.

138. (Currently Amended) The pattern drawing method described in claim 131, ~~further comprising the steps of conducting a pattern drawing for~~ wherein the irradiation of the electron beam to the curved surface ~~portion of the base material~~ is controlled based on ~~the basis of the~~ a dose distribution for a scanning position of the electron beam ~~at the time of forming~~ to form at least one pitch of a diffractive grating ~~with a tilt~~ including an inclined portion on the curved surface portion ~~of the base material~~, and ~~conducting a pattern drawing of~~ to form concave and convex portions ~~on the basis of the dose distribution for the concave and convex portion at the time of forming the concave and convex portions for reducing surface reflection for~~

in the at least one pitch of the diffractive grating as the reflection reducing structure.

139. (Previously Presented) The pattern drawing method described in claim 128, wherein the reflection reducing structure comprises a plurality of concave and convex portions having a function of structural birefringence.

140. (Previously Presented) The pattern drawing method described in claim 128, wherein the reflection reducing structure comprises a plurality of hole portions.

141. (Currently Amended) The pattern drawing method described in claim 140, wherein each of the hole portions has a tapered shape ~~becoming~~ which becomes smaller as ~~being depper~~ the hole portion extends deeper.

142. (Currently Amended) The pattern drawing method described in claim 140, wherein an opening diameter of the hole portions is ~~shaped in an order of sub-micron~~ less than one micron.

143. (Currently Amended) The pattern drawing method described in claim 128, wherein the reflection reducing structure

~~has a structure to reduce the~~ reduces reflection of a light beam ~~being~~ incident on or outgoing from the reflection reducing structure.

144. (Currently Amended) ~~The~~ A pattern drawing method ~~described in claim 123,~~ of forming a predetermined pattern on a layer of a base material, said method comprising:

irradiating an electron beam onto the pattern-drawn layer to draw the predetermined pattern;

wherein the layer comprises a curved surface on which the predetermined pattern is drawn;

wherein the predetermined pattern corresponds to a specific pattern for an optical element; and

wherein the specific pattern ~~includes~~ comprises a polarized light splitting structure.

145. (Currently Amended) The pattern drawing method described in claim 144, wherein the polarized light splitting structure ~~has a nearly~~ comprises a plurality of concave portions and convex ~~shape~~ portions in ~~a~~ cross-section and has ~~an approximately~~ a substantially circular shape in ~~a~~ plan view.

146. (Currently Amended) The pattern drawing method described in claim 145, wherein ~~, in the polarized light~~

~~splitting structure,~~ the plurality of convex portions comprise a plurality of sets of a first convex portion having a first width and a second convex portion having a second width different from the first width ~~are formed plural sets~~ with an interval between the first convex portion and the second convex portion.

147. (Currently Amended) The pattern drawing method described in claim 145, wherein ~~, in the polarized light splitting structure,~~ the plurality of concave portions and the plurality of convex portions comprise:

a first convex portion having a first width;

a first concave ~~and convex~~ portion having a second width different from the first width; and

a second concave portion ~~are formed alternatively, and wherein a first convex portion having a first width and a first concave portion having a second width different from the first width are alternately formed in the first concave and convex portion and the second concave portion has~~ having a third width different from the first width and the second width; and

wherein the first convex portion and the first concave portion are adjacent, and the second concave portion is adjacent to the adjacent first convex and first concave portions.

148. (Currently Amended) The pattern drawing method described in claim 144, wherein the polarized light splitting structure ~~has such a structure as to split an~~ splits a light beam incident thereto or outgoing ~~light beam~~ therefrom into at least two polarized light components oscillating in directions perpendicular to each other ~~on~~ in a plane crossing a ~~proceeding~~ traveling direction of the light beam.

149. (Currently Amended) The pattern drawing method described in claim 144, wherein the polarized light splitting structure ~~has such a structure as to split~~ splits a parallel light flux into a plurality of light fluxes composed of P polarized light and S polarized light having optical paths close to each other ~~respectively~~.

150. (Currently Amended) ~~The~~ A pattern drawing method ~~described in claim 123,~~ of forming a predetermined pattern on a layer of a base material, said method comprising:

irradiating an electron beam onto the pattern-drawn layer to draw the predetermined pattern;

wherein the layer comprises a curved surface on which the predetermined pattern is drawn;

wherein the predetermined pattern corresponds to a specific pattern for an optical element; and

wherein the specific pattern ~~includes~~ comprises a birefringence phase structure.

151. (Currently Amended) The pattern drawing method described in claim 150, wherein the birefringence phase structure ~~has a~~ comprises a plurality of concave portions and convex ~~shape~~ portions in a cross-section and ~~an approximately~~ a substantially circular shape in a plan view.

152. (Currently Amended) The pattern drawing method described in claim 151, wherein ~~in the birefringence phase structure, a~~ the plurality of concave portions and convex portions comprises alternately formed convex ~~portion~~ portions having a first width and a concave ~~portion~~ portions having a second width shorter than the first width ~~are alternately formed~~.

153. (Currently Amended) The pattern drawing method described in claim 150, wherein the birefringence phase structure ~~is such a structure that~~ produces a phase difference between ~~one linearly polarized light flux and the other linearly polarized light flux among~~ incident or outgoing linearly polarized light fluxes oscillating in directions perpendicular to each other ~~respectively~~.

154. (Currently Amended) The pattern drawing method described in claim 150, wherein the birefringence phase structure ~~is such a structure that~~ produces a phase difference between light fluxes comprising at least a P polarized light flux and a S polarized light flux ~~among a plurality of light fluxes~~.

Claims 155-170 (Canceled).